



Miniature plain guidance systems

Maintenance-free

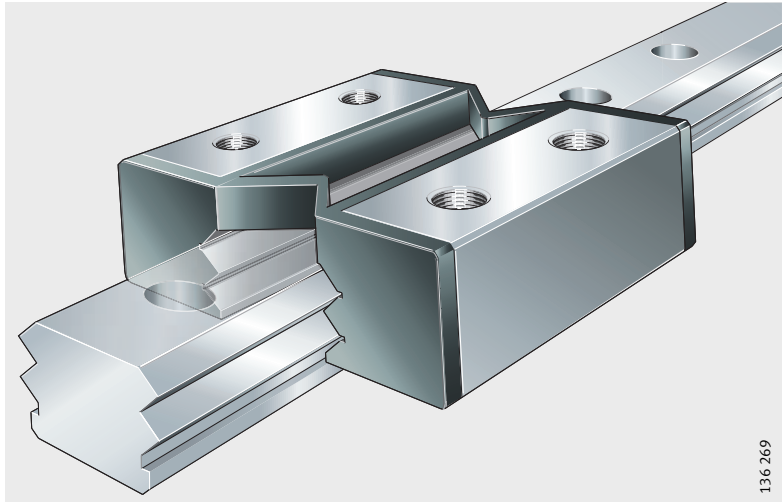
Miniature plain guidance systems

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Product overview Miniature plain guidance systems

**Miniature plain
guidance system**
Maintenance-free

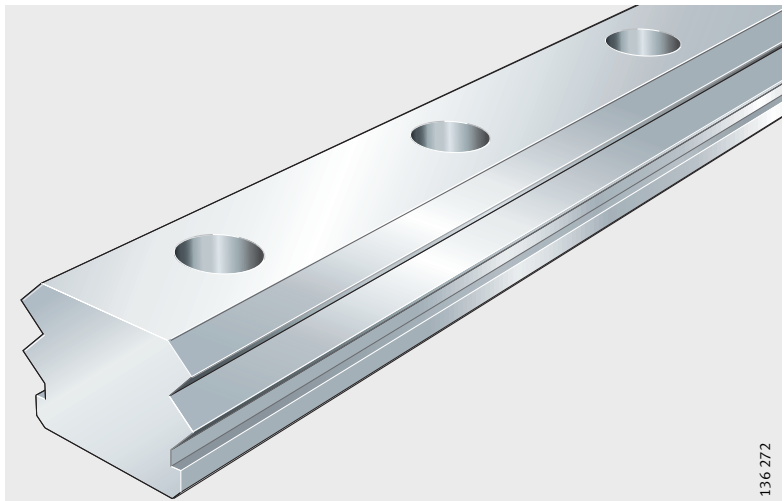
GFW, GFS



136 269

Guideway

GFS



136 272

Miniature plain guidance systems

Features Miniature plain guidance systems are ready-to-fit, maintenance-free guidance systems for stroke lengths of up to 3 metres. They have good sliding characteristics, are suitable for dry running, have adjustable clearance and are highly resistant to chemical influences. The sliding material has only a very small capacity for water absorption.

The guidance systems operate substantially free from stick-slip, undergo little wear, are insensitive to contamination and, due to their aluminium construction, are highly suitable for use in light metal designs made from aluminium. They do not place high demands on the geometrical and positional accuracy of mounting surfaces.

In terms of design space, miniature plain guidance systems have the same mounting dimensions as miniature linear recirculating ball bearing and guideway assemblies. They are produced in various carriage sizes and guideway lengths, giving cost-effective designs.

Guideways and carriages are not preassembled and are therefore supplied separately. Carriages and guideways can be interchanged and used in any combination.

Load carrying capacity Miniature plain guidance systems are linear locating bearings with at least one carriage. They can support forces from all directions – apart from the direction of motion – and moments about all axes.

Sealing and lubrication Due to the sliding layer, the miniature plain guidance systems are maintenance-free but can also be lubricated with oil or grease.

Operating temperature The guidance systems are suitable for temperatures from $-40\text{ }^{\circ}\text{C}$ to $+80\text{ }^{\circ}\text{C}$.

Miniature plain guidance systems

Carriage The main body is made from extruded and anodized aluminium, the end faces and holes are not anodized. The basic design comprises the carriage body with the sliding layer, the two end faces and spring crosspieces.

The sliding layer, end faces and spring crosspieces are made as a single component from plain bearing material and rigidly fixed to the main body.

Guideway The guideways are made from extruded and anodized aluminium. The end faces and holes are not anodized. The guideways have slideways on both sides for the carriage.

Through holes with counterbores for the fixing screws allow quick and easy fixing of the guideways to the adjacent construction.

Applications The guidance systems are highly suitable for applications with:

- low loads
- moment loads
- dry running
- severe contamination.

Design and safety guidelines

Permissible loads and speeds

Caution! The values given in the table must not be exceeded.

Loads and speeds

Feature	Unit	Value
Maximum pv value for dry running	pV_{\max}	$0,2 \text{ N/mm}^2 \cdot \text{m/s}$
Permissible specific load carrying capacity (static)	p_{\max}	4 N/mm^2
Permissible sliding speed for dry running	v_{\max}	1 m/s

Setting the bearing clearance

Before mounting, the carriage and guideway have clearance in relation to each other.

The permissible bearing clearance is dependent on the load, sliding speed, temperature, cycle time and lubrication if present.

- Caution!** The bearing clearance must be set to 0,1 mm, for:
- maximum load
 - maximum travel velocity
 - 100% operating duration
 - dry running.

Setting the bearing clearance

The bearing clearance can be set:

- by means of a screw in the adjacent construction, *Figure 1* or
- by pressing the carriage onto the guideway by hand and tightening the screws in the carriage in this position, *Figure 2*.

① Adjustment screw

Figure 1
Setting the bearing clearance using an adjustment screw

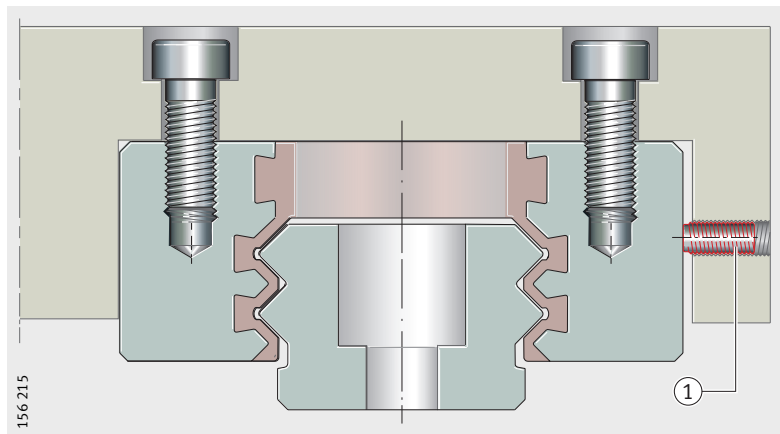
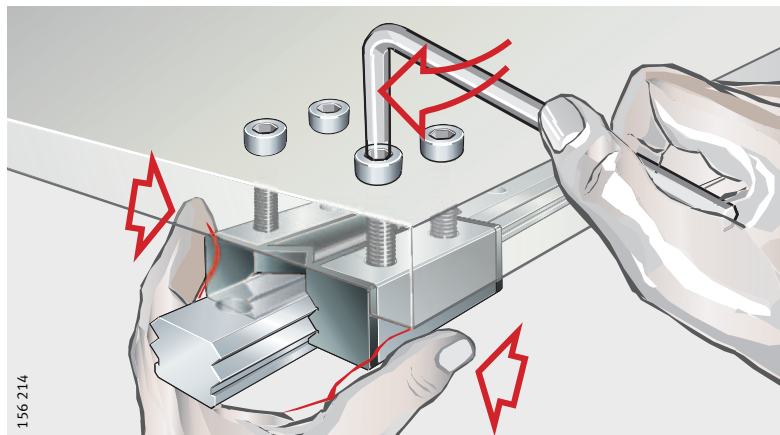


Figure 2
Setting the bearing clearance by hand



Miniature plain guidance systems

Hole patterns

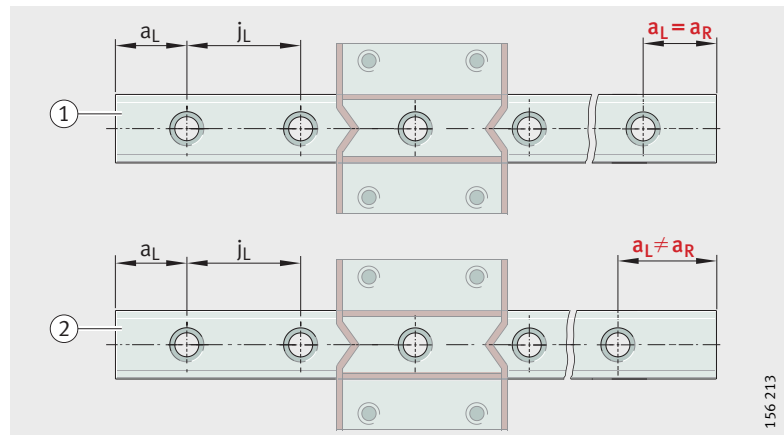
Unless specified otherwise, the guideways have a symmetrical hole pattern, *Figure 3*.

An asymmetrical hole pattern may be available at customer request. $a_L \geq a_{L \min}$ und $a_R \geq a_{R \min}$ is necessary, *Figure 3*.

- ① Symmetrical hole pattern
- ② Asymmetrical hole pattern

Figure 3

Hole patterns of guideways with one row of holes



Maximum number of pitches between holes

The number of pitches between holes is the rounded whole number equivalent to:

$$n = \frac{l - 2 \cdot a_{L \min}}{j_L}$$

The distances a_L and a_R are generally determined by:

$$a_L + a_R = l - n \cdot j_L$$

For guideways with a symmetrical hole pattern:

$$a_L = a_R = \frac{1}{2} \cdot (l - n \cdot j_L)$$

Number of holes:

$$x = n + 1$$

a_L, a_R mm
Distance between start or end of guideway and nearest hole

$a_{L \min}, a_{R \min}$ mm
Minimum values for a_L, a_R according to dimension tables

l mm
Guideway length

n –
Maximum possible number of hole pitches

j_L mm
Distance between holes

x –
Number of holes.

Caution! If the minimum values for a_L und a_R are not observed, the counterbores of the holes may be intersected.

Demands on the adjacent construction

The running accuracy is essentially dependent on the straightness, accuracy and rigidity of the fit and mounting surfaces.

The straightness of the system is only achieved when the guideway is pressed against the datum surface.

If high demands are to be made on the running accuracy and/or if soft substructures and/or movable guideways are used, please contact us.

Geometrical and positional accuracy of the mounting surfaces

The higher the requirements for accuracy and smooth running of the guidance system, the more attention must be paid to the geometrical and positional accuracy of the mounting surfaces.

Caution!

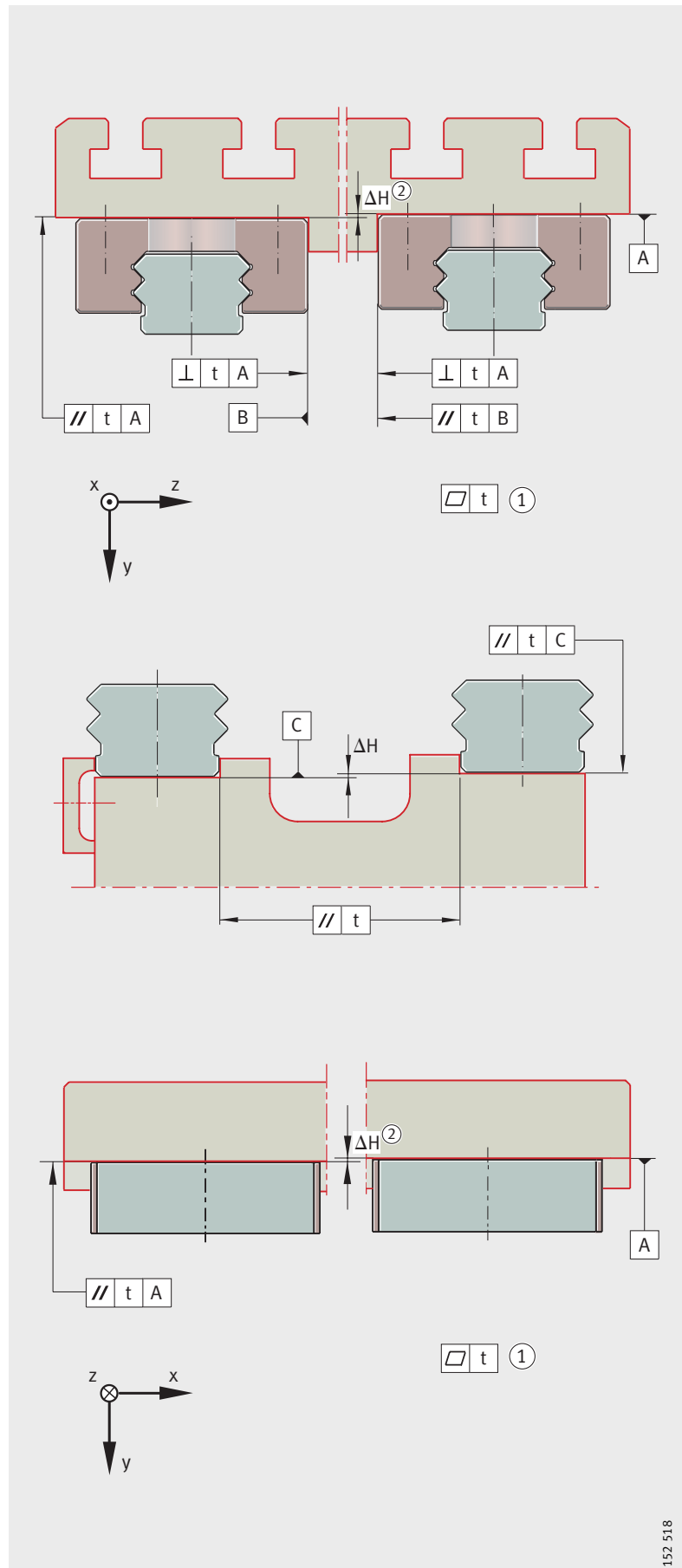
The tolerances according to *Figure 4*, page 8 and table Values for parallelism tolerances t , page 9 must be observed.

Surfaces must be precision milled with the aim of achieving a mean roughness value $R_a3,2$.

Deviations from the stated tolerances will impair the overall accuracy, change the clearance and reduce the operating life of the guidance system.

The parallelism deviation t and the height difference ΔH should never in total exceed the set clearance, *Figure 4*, page 8 (ΔH in μm is the largest permissible deviation from the theoretically precise position).

Miniature plain guidance systems



**Parallelism
of mounted guideways**

For guideways arranged in parallel, the parallelism t should be in accordance with *Figure 4*, page 8 and table. If the maximum values are exceeded, a larger clearance must be set. If larger tolerances are present, please contact us.

Values for parallelism tolerances t

Miniature plain guidance systems Designation	Parallelism tolerance ¹⁾ t μm
GFW7/GFS7	20
GFW9/GFS9	25
GFW12/GFS12	30

¹⁾ Dependent on clearance.

Locating heights and corner radii

The locating heights and corner radii should be in accordance with table and *Figure 5*.

Locating heights and corner radii

Miniature plain guidance systems Designation	Locating heights		Corner radii	
	h_1 mm	h_2 mm max.	r_1 mm max.	r_2 mm max.
GFW7/GFS7	3	1	0,4	0,2
GFW9/GFS9	4	1,5	0,4	0,4
GFW12/GFS12	5	2	0,4	0,4

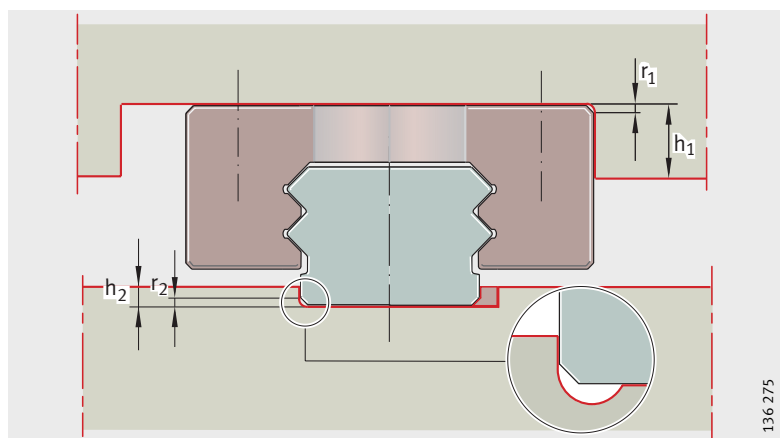
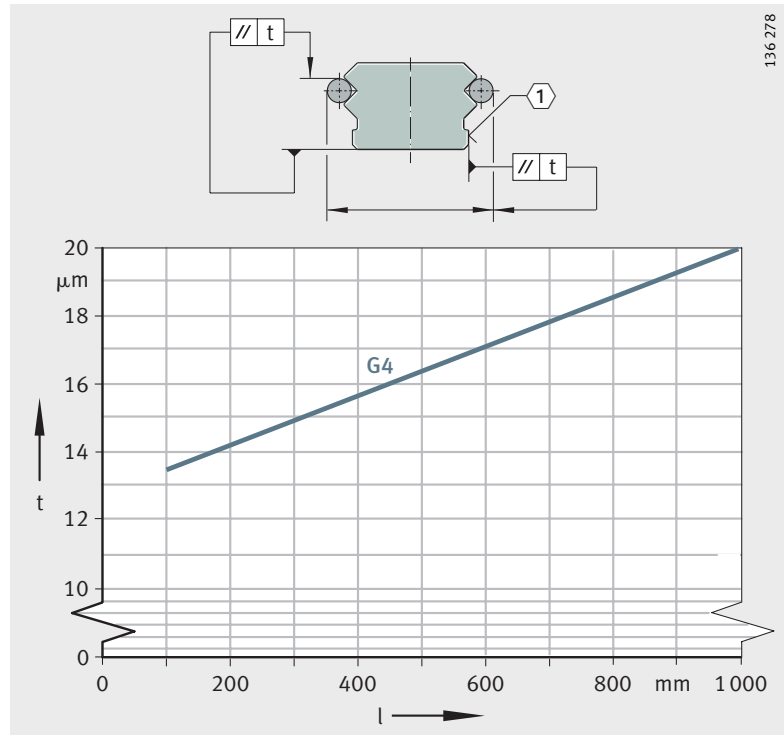


Figure 5
Locating heights and corner radii

Miniature plain guidance systems

Accuracy Accuracy classes

Miniature plain guidance systems are available in accuracy class G4, *Figure 6*. The accuracy class is stated in relation to the parallelism of the guideway. The data in the table on page 11 are dependent on the set bearing clearance and are therefore valid only under certain conditions.



t = parallelism tolerance
in differential measurement
 l = total guideway length
① Locating face

Figure 6
Accuracy classes
and parallelism tolerances
of guideways

Parallelism of raceways to locating surfaces

The parallelism tolerances of guideways are shown in *Figure 6*.

Tolerances

Tolerances: see table and *Figure 7*.

The tolerances are arithmetic mean values. They relate to the centre point of the screw mounting or locating surfaces of the carriage.

The dimensions H and A₁ (table Accuracy class tolerances) always remain within the tolerance irrespective of the position of the carriage on the guideway.

Accuracy class tolerances

Tolerances		Accuracy class G4 μm
for height ¹⁾	H	±150
for distance ¹⁾	A ₁	±200

¹⁾ When set free from clearance.

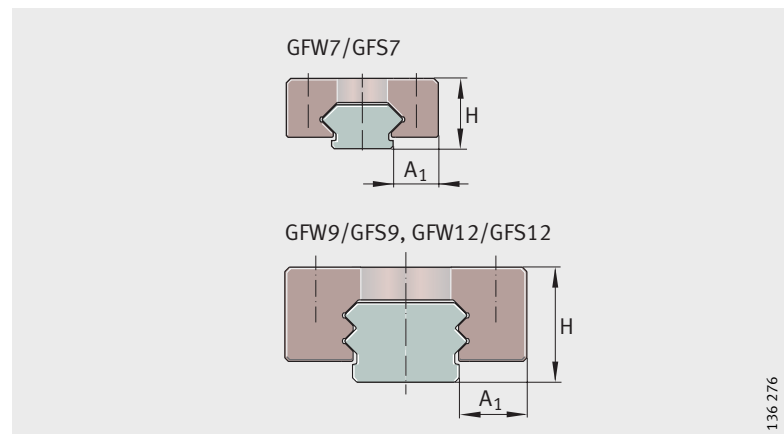


Figure 7

Reference dimensions for accuracy

136 276

Miniature plain guidance systems

Positional and length tolerances of guideways

The positional and length tolerances are shown in *Figure 8* and table. The hole pattern corresponds to DIN ISO 1101.

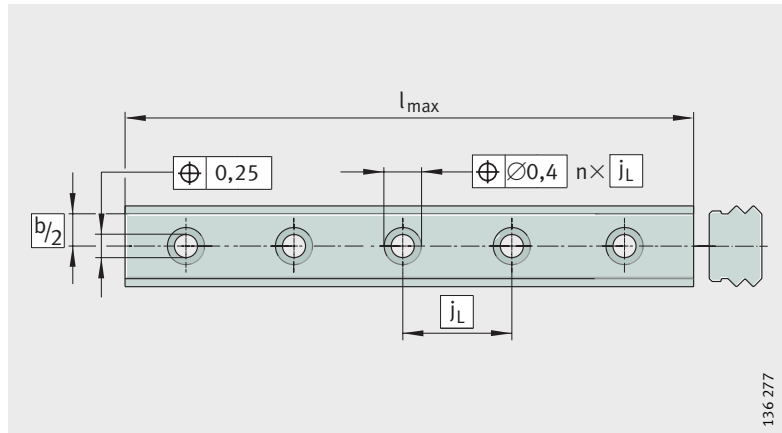


Figure 8
Positional and length tolerances of guideways

Length tolerances of guideways

Tolerances of guideways/carriages, dependent on length l_{\max} ¹⁾	
Guideway length mm	
≤ 300	> 300
$\pm 0,05$	$\pm 0,15\%$

¹⁾ Length l_{\max} see dimension table, page 14.

**Ordering example,
ordering designation
Unit, guideway with
symmetrical hole pattern**

Guideways and carriages must be ordered separately.

Miniature plain guidance system with
two carriages GFW9
one guideway GFS9
Length of guideway 1 000 mm

Ordering designation 2×**GFW9**, *Figure 9*
 1×**GFS9/1 000**, *Figure 9*

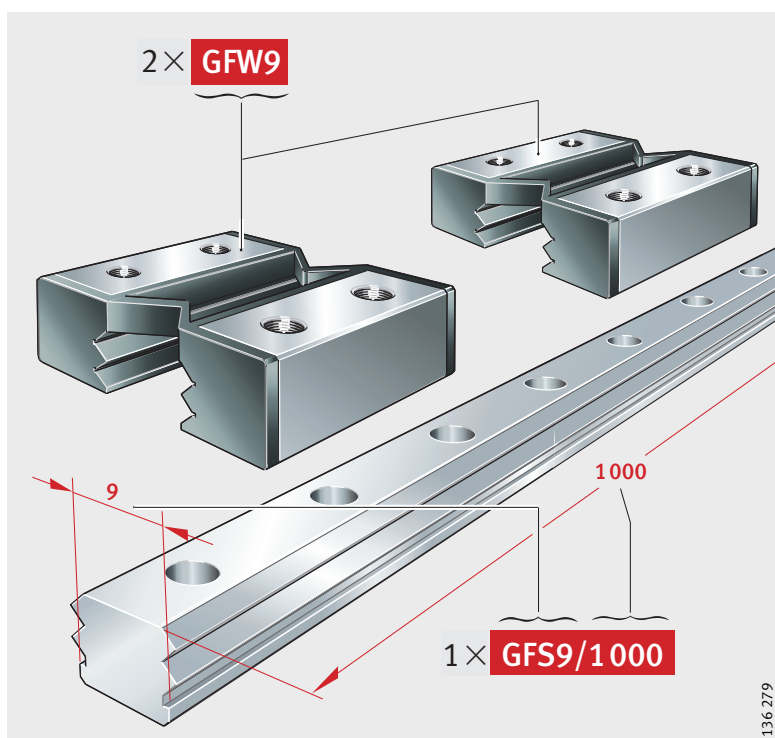
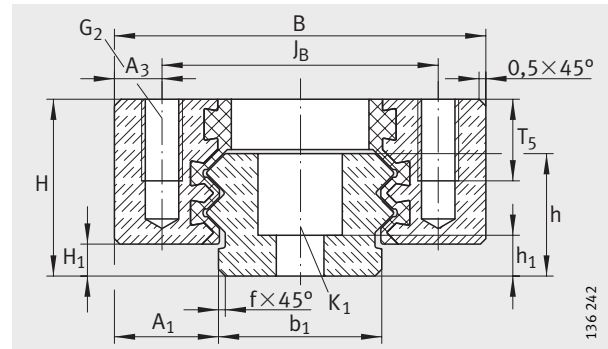


Figure 9
Ordering example,
ordering designation

Miniature plain guidance systems

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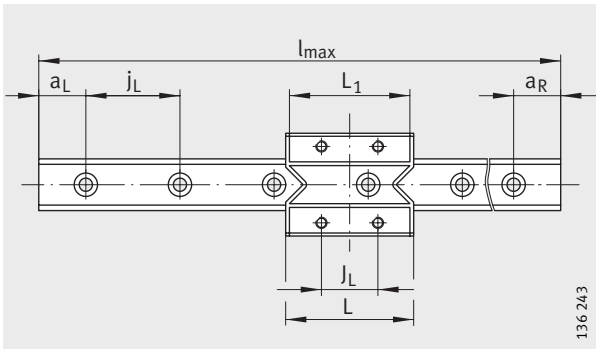


GFW with GFS

Dimension table · Dimensions in mm

Carriage		Guideway		Dimension						Mounting dimensions		
Designation	Mass ≈g	Designation	Mass ≈g/m	H	B	L	h	b ₁	l _{max} ¹⁾	A ₁	J _B	A ₃
GFW7	4	GFS7	100	8	17	23,5	5	7	3 000	5	12	2,5
GFW9	7	GFS9	160	10	20	30	6,75	9	3 000	5,5	15	2,5
GFW12	13	GFS12	290	13	27	34	9	12	3 000	7,5	20	3,5

- 1) Maximum length of one guideway.
- 2) a_L and a_R are dependent on the guideway length.
- 3) In relation to a carriage at a sliding speed of 0,5 m/s.



GFW with GFS · View rotated through 90°

													Basic load ratings	
L ₁	j _L	j _L	a _R ²⁾		a _L ²⁾		f	H ₁	T ₅	h ₁	K ₁	G ₂	C ³⁾	C ₀
			min.	max.	min.	max.							N	N
21,5	8	15	5	12	5	12	0,3	1,3	3	1,4	M2	M2	21,3	213
28	13	20	5	17	5	17	0,5	1,7	4	2,5	M2	M2	39,7	397
32	15	25	5	21	5	21	0,5	2,35	6	3	M3	M3	48,1	481

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